DOCUMENT RESUME

ED 446 913 SE 063 864

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TITLE Student-Student Negotiation: Characteristics of Constructing Understanding. Second Year Project.

PUB DATE 1999-03-00

NOTE 12p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (Boston, MA, March 28-31, 1999).

AVAILABLE FROM For full text: http://www.narst.org.

PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS *Cooperative Learning; Foreign Countries; Group Dynamics; Higher Education; Interpersonal Communication; *Nonmajors; *Science Education

IDENTIFIERS *Argentina

ABSTRACT

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ED 446 913

NARST Conference Presentation

-Second Year Project-

Student-Student Negotiation:

Characteristics of Constructing Understanding

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Abstract

The purpose of this study was to examine student-student negotiation of understanding. The goal was to see how students negotiate, what norms affect students during negotiation, and what characteristics influence student negotiation. The studyís participants were non-science majors engaged in cooperative learning groups during a 10 week summer session in Argentina. The course was a general education science course taken by students from a local university in its international program. The students were placed randomly in groups of four and videotaped as they attempted to reach a group understanding for a discrepant event. In addition to the videotaping, classroom artifacts were examined using an ethnographic approach. The preliminary results indicate that, as students negotiate with each other, prior experience plays a vital role in the construction of knowledge. Also, as students negotiate for understanding, they are affected by the status given certain members of the group by the group.

Introduction

Sometime during the process of teaching at public and private secondary schools for 14 years, I came to the conclusion that "learning" required both teachers and students to be active. I found that student engagement, in the various learning activities in class, was crucial to the success of the individual student and to the class as a whole. Much anecdotal evidence from those years exists that confirms this statement. I present this argument in order to provide the reader with a glimpse of what notions

existed in my mind as I began my graduate work at UCSB. The first quarter of courses challenged many of the "experience" driven ideas I had come to hold as truths regarding classroom interaction. New words with specialized meanings such as agency, reflection, collaboration, and culture became driving influences in my own negotiation of understanding(Bruner, 1996). These thoughts focused on how students learn. As I compared and contrasted this terminology and its meaning with my practical experience, certain questions came to my mind. Questions such as what actions, interactions, and roles are involved as students seek to gain understanding and how did the interactions contribute to the construction of understanding within an individual.

As I mentioned earlier, I was very aware that students must be active in the learning process. Initially, the classroom interaction was centered between the students and me. I discovered over time though, that students needed to engage each other as well. Matter of fact some of the best learning activities I observed was when students challenged each other's understanding of a specific topic or position on a certain issue.

So, as I wrestled with this whole process of student negotiation during my first year at UCSB, the focus of my second year project began to become clear. This study, the result of the meeting between my previous education experience and my present graduate work, looks at student-student negotiation for understanding and attempts to uncover characteristics that are present when students attempt to gain understanding. I will begin this paper by detailing my theoretical framework and then will move to the research questions, methodology, and results. The last section will focus on what implications, if any, can be drawn from this study.

Theoretical Framework

In examining student-student negotiation, I used a few specific lenses to frame this study. There were actually two sets of theoretical domains that were significant in this project. The first set was composed of social constructivism, cooperative learning, and classroom norms. The second set, which came into play after I began my analysis of the data, was the role of prior knowledge and status in learning. I will first discuss the original group of theories that were used to frame this study and then I will review the added set.

Social Constructivism

Social constructivism is not a new theory but one that has a long history in educational paradigms. Vygotsky claimed, many years ago, that robust knowledge and understandings are socially constructed through verbal communication, activity, and interaction around meaningful problems (Warren & Rosebery, 1989). The following analogy may help provide clarity. When the majority of the highways are upgraded, due to usual wear and tear or even expansion, we rarely see construction workers start completely from scratch. Usually, they do their work, a group effort, on the foundation that already exists. This everyday life experience of road repair/construction is a useful image in providing meaning to the concept of social constructivism in education. Bruner (1996) suggested several tenets that guide the psycho-cultural approach to education. One of the tenets he detailed is constructivism, which he reasoned is the way students impute "reality" to the "worlds" they inhabit. He also argued the idea that students are not a tabula rasa or blank slate, but on the contrary, come to the classroom full of ideas, understandings, and narratives constructed long before they entered. The knowledge that students posses, whether it be public knowledge that is contained within the various disciplines or the cognitive structures and skills of individual learners is constructed (Phillips, 1995).

In examining the findings of Johnson and Johnson (1997), it is evident that negotiation can plays a role in the social construction of student understanding. A summary of what they discovered while examining recent works in this area follows:

> 1. It appears that constructive argument is important to a cooperative group and enhances learning. The use of controversy, disagreement and discussion in groups is encouraged.
>
> 2. There is increasing evidence that students who "talk through" material with peers learn it in a more effective way than students who just read or listen to material.
>
> 3. A number of studies focus on the effects of positive interdependence on learning of groups. It appears that the stronger the "we sink or swim together" feeling in a group, the more likely the group will be successful and that all members will master the material.
>
> 4. A number of current studies indicate that sending students to the computer in small groups that "cannot touch the key until they all agree" is a more powerful way to learn at the computer than having each student working alone at his or her own computer.
>
> 5. It appears that retention of information is enhanced in the cooperative setting and that students who work in cooperative relationships are more likely to have conscious strategy for how they got to the answer. It would appear that initial strategies for problem solving are often intuitive when seeking an answer and are invented when students try to explain to each other the rationale for their answers. (p. 2)

What is evident in this study is that students' learning is enhanced when they work socially to gain new understanding. When

they do attempt to gain understanding they must evaluate what they already understand. This evaluation could lead students to change or discard previous understanding or choose to build on it (McCormick & Pressley, 1996).

A teaching strategy that is very useful in the social construction of knowledge is cooperative learning. There is almost a symbiotic partnership formed with the use of cooperative learning in the construction of understanding. That partnership is reiterated by Lorsbach & Tobin (1997) who said

> When oneís conceptions of the world are inviable one tries to make sense out of the situation based on what is already known. "Others" are so important for constructivists that cooperative learning is a primary teaching tool. A cooperative learning strategy allows individuals to test the fit of their experiential world with a community of others. (p.)

It is this testing, with both rejections and acceptance, which will lead to socially constructed knowledge and understanding.

Cooperative Learning

> Cooperative learning is a specialized form of collaborative learning that requires students to fulfill academic task goals following a specified plan for student productivity and student interaction. The success of the group in attaining its task goals depends upon group members helping each other perform a task, and upon each memberís development of requisite expertise to contribute to the group (Durán, 1994, p.).

As Duran argues, each member of the cooperative group contributes their "requisite expertise" to the community. What this suggests, in light of the inclusionary definition of scientific inquiry as found in Science for All Americans, is that more students will be making contributions.

The doing of science is not enough though. Bruner (1996) explained that there exists today a much clearer understanding of how crucial the role of thinking is as students seek to gain new understanding (Bruner, 1996). Cooperative learning provides an excellent avenue for students to think out loud as they contemplate what to do and why they are doing it. Research based on cooperative learning has indicated that social interaction between peers who bring different perspectives to bear upon a problem is a highly effective means of inducing cognitive development (Tudge, 1990). The negotiation of these perspectives, with both rejections and acceptance, will lead to constructed knowledge and understanding.

Another very convincing segment of evidence pertaining to the effectiveness of cooperative learning comes again from the work of Johnson & Johnson (1997). They have spent time studying over 600 research projects collected at the Cooperative Learning Center at the University of Minnesota. These studies date back to the 1800ís and are focused on comparisons of learning in cooperative, competitive, and individualistic goal structures. Some of their findings include:

- More students learn more material when they work together, cooperatively, talking through the material with each other and making sure that all group members understand, than when students compete with one another or work alone, individualistically.
- More students are motivated to learn the material when they work together, cooperatively, than when students compete or work alone, individualistically (and the motivation tends to be more intrinsic).
- Students have more positive attitudes when they work together, cooperatively, than when they compete or work alone, individualistically. Students are more positive about the subject being studied, the teacher, themselves as learners in that class, and are more accepting of each other (male or female, handicapped or not, bright or struggling, or different ethnic backgrounds) when they work together cooperatively. (p. 6)

If the findings by Johnson and Johnson are true, then students should experience greater motivation, learn more material, and have more positive attitudes as they work socially to construct scientific understanding in cooperative learning groups.

Classroom Norms

In order to transform a "regular" classroom in to a learning community, teachers must see their classes as more than just individual parts - teachers, students, material. In Tuyay, Jennings, and Dixon's (1995) work, they examined recent studies that use a social-constructionist perspective to describe classroom life. Based on the findings of those complimentary bodies of work, they come up with premises relating to the classroom.

> 1. A classroom is a culture in which a group of people construct common knowledge, language, and patterned ways of engaging with each other through moment-by-moment interactions. . . . .
>
> 2. Patterns of life (e.g., ways of interacting, communicating, and negotiating are constructed over time and become ordinary to members. . . .

> 3. Through the patterns of life within and across time and space, members of a class construct a group history, which they, in turn, draw on to interpret and participate in subsequent interactions, events, and aspects of everyday life. . . .
>
> 4. Living in particular classrooms leads to particular ways of being a student or a teacher, to the construction of particular types of knowledge, to particular understandings of options in learning, and to particular types of access to schooled knowledge. . . .
>
> 5. By identifying key events and cycles of activity within the classroom the social and academic demands for participating and learning become visible. These demands are reflected in the roles and relationships, rights and obligations, and norms and expectations of members. . . .(p. 77)

This classroom culture mentioned above is not created by an individual but by all the members that make up that learning community. Gee and Green (1998) remind us that, as cultural models are formed, the students are not map readers but mapmakers. They also pointed out that the community of learners, members of a particular classroom, set normative rules and operations. Thus, a teacher should not just be aware of the bigger picture, of seeing their classroom as a culture, but must be active in the actual building of that classroom culture. The teacher should help their community of learners, which they are a vital part of, develop specific, desired norms that lead to an effective learning environment. According to Blosser (1990), "If we want students to function as independent thinkers, we need to provide opportunities in our science classes that allow for greater student involvement and initiative and less teacher domination of the learning process" (p.1). Newton and Rogers (1996) describe the contrast of styles between student-sensitive and teacher-centric as follows:

Student-sensitive

Students expected to be active participants

Students challenged to think

Students receive lots of feedback

Pace and level suited to student's need

Negotiated programme of work

Teacher -centric

Students expected to be passive listeners

Students are 'told the facts'

Students' ideas are not elicited

Rigid pace at fixed level

Limited variety of activity

Dictated schedule of activities (p.265)

The goal is to provide a climate that encourages student engagement in the learning process. Norms that take the teacher out of the center and put the students in a position of significance can foster that type of climate. What eventually is produced is a classroom where the community of learners have created, through social interaction, particular norms for talking, thinking, acting, and most importantly as far as this paper is concerned, interacting (Kelly, Chen, & Crawford, 1998, Green & Dixon, 1993).

As I mentioned in my introduction, there was a second set of theoretical perspectives that surfaced while I was conducting my analysis of the data. In order to help the reader understand additional frames of reference that were used in the analysis of this project's data, I briefly present the significance of prior knowledge and status on student learning.

Prior Knowledge

As mentioned earlier, students come into the classroom with previously constructed understanding. In Mind in Society, Vygotsky (1978) pointed out that, "Any learning a child encounters in school always has a previous history" (p. 84). This previous history is what many researchers refer to as prior knowledge. According to Osman and Hannafin (1994), "Learners posses, to varying degrees, metacognitive resources that can be invoked or elicited to engage lesson content more deeply" (p. 5). Students access these resources in order to make meaning of the new material with which they are confronted. Johnson

and Lawson (1998) acknowledged the significance of prior knowledge in science learning, though they argued that reasoning ability may have more of an influence in gaining understanding. They commented concerning prior knowledge, "According to Novak [1977a, 1990], learners acquire a hierarchically organized framework of specific concepts, each of which (or some combination of which) permits them to make sense out of new experience. If these prior concepts are lacking, one cannot acquire new concepts" (p. 90). So, the fact that prior knowledge does exist and does play an important role in new knowledge construction makes it an area that demands our attention as educators. Schmidt (1987) framed the significance of prior knowledge to the gaining of new understanding as he stated:

> Prior subject matter knowledge acts as a frame of reference within which new information can be understood and enables scaffolding for the representation of new concepts in memory (Anderson, Spiro, & Anderson, 1978). However, prior knowledge needs to be activated in order to provide a context for the integration of new information from text." (p. 6)

Schmidt pointed out that it is not enough just to have prior knowledge but that the prior knowledge must also be activated. The role of the teacher may be to seek ways to promote this activation.

Status

In a 1997 study, Bianchini argued, "Status influences which students participate in small groups, and thus which students can learn science" (p.1061). She defined status based on her research of groupwork and the influence of studies by Cohen and Lotan (1994,1995). She found that students negotiated status positions within their groups. The student's status ranged from high to low and that status affected whether or not they would be allowed to contribute to the group's negotiation. She also found many instances where the status given a particular student did not necessarily match the ability or competence of that student. An example of this can be shown as demonstrated in the case of Miguel. Miguel was a student who was not allowed to be a major contributor to the group because he was of low status. Yet, Miguel happened to be the only one of the group who was able to finish a certain task that other group members had deemed too difficult.

In Goodwin's study (1984), he pointed out that high and low status is a two way street. In order for some to have a high or low status someone must be willing to give the status and someone must be willing to receive the status. As group members give and receive status the results are shown by the language that is used by and with different group members. Concurring with this argument is Tannen (1993), who stated that for any given linguistic feature, the meaning is jointly constructed by all participants in a group. The status that students give and receive is negotiated by the students in a particular peer group (Kyratzis, in press). As stated by Bianchini, the status of students in a group can affect their participation and thus their negotiation of understanding.

Review Questions and Methodology

Research Questions

As I mentioned earlier, my previous teacher career provided me with many anecdotal events concerning student interactions within the classroom. The conviction I possessed of the value of these interactions combined with what I experienced in my first year of graduate education led to the review questions of this project. There are three questions driving this research. First, how do students negotiate understanding with other students? Second, what norms affect students during student-student negotiation? And third, what characteristics influence student-student negotiation?

Setting and Sample

This study was conducted in Buenos Aires, Argentina as part of a local university's international program. The students were from the United States. The course, Science as a Way of Knowing, was a general education science course taken by non-science majors. The primary purpose of offering this course through an international program was to give students more options to fulfill general education unit requirements. Therefore, the students were not highly motivated to take this specific science course.

The class had 8 students of whom 6 were female and 2 were male. There were 3 female and 1 male that were members of minority groups in the United States. The class met two times a week for approximately 8 weeks. Though the students were all taking various levels of Spanish as part of the program, the class was taught in English.

Instructional Context

The students were encouraged, as all my classes are, to become active within this new learning community. Their interactions

in class were not only teacher-student in nature but also student-student. Cooperative learning groups were formed at random with no formal groupwork model used.

Under investigation was the negotiation that took place as students came to a group consensus on a discrepant event. These discrepant events were produced by Paul Hewitt and published in The Physics Teacher over a period of years. The procedure was as follows: First, the student was given the discrepant event and asked to come up with their own solution. They were then placed at random in their group and asked to work together to came up with a group answer.

Methods

This study was conducted using an ethnography approach with the researcher also being the instructor of the course. This allowed me to have an emic perspective as I conducted this research as a participant observer. According to Spradley (1980), "The participant observer comes to a social situation with two purposes: (1) to engage in activities appropriate to the situation and (2) to observe the activities, people, and physical aspects of the situation" (p. 54).

At the beginning of the class a questionnaire was given to each student that probed their attitude toward science. During the course of the study, field notes were made at various times. Individual student interviews were conducted at the end of the class for 7 of the 8 students. The primary data-collecting instrument was the video camera. Each time a discrepant event was given, one group of four students was videotaped.

Results

In presenting the results of this study, I will focus on the research question asked and present the transcription of what I believe to be a telling case for my finding. The results will therefore be presented within the confines of the specific research question originally asked.

How do students negotiate understanding with other students?

I found that the first thing students must be willing to do as they begin negotiation is to choose to take up the role as a negotiator. Within the gaining of understanding exists a road that leads from novice to expert. Students, for a variety of reasons which will not be discussed in the scope of this study, are not all on that road. In order to have student-student negotiation, the students must be willing to take up the role as a traveler.

Amy (A) was a student who showed no affinity for science as evidenced by one on one conversations and her responses on the initial questionnaire. At the beginning of the course she was very unsure of her ability to learn science and was not an active participant. Over the course of the class, Amy chose to travel the road that leads from novice to expert. The following transcript shows Amy in a discussion toward the end of the class. The students are faced with the discrepant event involving identical balls rolling over two separate, inverted tracks. They are being asked to decide which ball would get to the finish line first. Will it be ball "a" that must over a hill to get to the finish line or ball "b" that must travel through a valley? When the time comes for Amy to speak within her group, she gets straight to the point.

A: I think that it is "b".

S: Why?

A: Because as it goes down

it goes its regular speed and then faster

It doesnít slow down

then it reaches its regular speed back at the top.

The other one it
it slows down to get to the top and then it

goes back to its regular speed

It never goes faster

That is why I think it is "b".

K: That sounds right to me.

S: It makes sense.

Amy has gone from being a bystander during student-student negotiation to being an active member within her group. She in turn was willing to share her understanding and be an active member in the class as a whole as well.

What norms affect students during student-student negotiation?

A classroom norm that became evident during the course of this study was the role of status. Students were given high and low status by other group members. The status given had an effect on who and how students were listened to during group negotiation. John (J) provided an excellent example of the giving and receiving of high status. John was given high status because of his science background, evidenced by his vocabulary, and because of the demeanor he used during group negotiation. John would not readily give information but instead held back until his expertise was needed. In this discrepant event, the question centered on where you should aim a laser in order to shoot a fish. Should you aim above, below, or right at the observed fish.

M: Are we going to write anything different

K: John do you have anything

J: I donít know that

M: In laymanís terms

J: Since the laser is a light you would think that

if you shine a light at the water a light is skewed

I mean it is bent

the water bends the light

does it not?"

M: yea it does

Now the significant feature here is not the answer that John gives. Matter of fact, John is on the right track. Two points are significant, first, group members want John to speak in layman's terms so that they can understand him. John is given high status and he accepts it be smiling and then beginning to give "the answer". Second, even though John shows uncertainty, which is very uncharacteristic of him in this setting, the group still gives him considerable influence. They hang on to what he has to say and try to make meaning of it. If another student wondered if their answer was on the right track, they would have been dismissed that answer and gone on to another possibility. This came up with Susan. She was actually a better student in this class than John but was never given high status by the groups she was in. She would explain her answer and even when she was right she would often be ignored. In the case of this discrepant event, she had the right from the beginning but was basically ignored.

What characteristics influence student-student negotiation?

In this study, prior knowledge was an influential characteristic during student-student negotiation. The setting for this transcript was identical to the one mentioned above. Kristy and Susan are discussing the laser and Kristy refers to her past experience with spear fishing. This activation of prior knowledge allows her to make meaning of the new situation with the laser.

S: What did you put?

K: I put that she should aim the laser below the observed fish because lightÖ

standing above.

I do not know if lasers work that way but spearing does

S: That makes sense though

K: I know if you aim for where it is observed you are not going to hit it because light bends it

S: Isnít that because it just moves

I just wrote

I put where you observe it

K: Because have you ever

M: I know that it spears it

K: With water,

water is going to bend like the way that the light looks

you know what I mean?

Kristy knows that light is bent because when, in past experience, she went spear fishing she was not successful at first. She would aim where she saw the fish but when she attempted to spear it she would miss. By aiming where she saw it and missing, Kristy figured out through experience that the image she saw not at the same place as the actual fish. In this discussion, she has not yet made the connection that the laser is a light and it is bent just like the light that is reflecting off the fish producing the image she sees. Her ability to activate prior knowledge though allows her to make connections and is received well by her group members.

A similar prior experience episode occurred during the discussion about the balls on the ramp mentioned in the first finding. Amy said that part of the reason she thought the ball going down the valley would get there before the ball going up the hill was because there was a dip in the road near her house that was fun to go down. She knew that the dip caused the trip to be fun (the car would go faster) and she could remember not feeling the same way about going up a hill. Thus, prior knowledge was prominent in the negotiation that took place with the cooperative learning group.

Implications

As I reflected on each of the three findings, I was impressed with the following implications. First, as I looked at Amy's transformation from a reluctant science student at the beginning of class to one who was confident of being a science learner at the end, the concept of apprenticeship came to mind. Bruner (1996) described learners as novices in need of training to reach expertise. Science novice is a great way to describe Amy as she entered the classroom in Argentina. She would be the first to point out, as she did to me on several occasions, that science was not an area of strength to say the least. Yet, as she became involved in negotiation for understanding in our science class she was willing to travel the road that leads from science novice to expert. Amy was willing to take up the role as an apprentice.

What seems a clear implication is students negotiate for understanding by initially being willing step on and travel the road that leads from novice to expert. If students are encouraged to engage in the process of negotiation for understanding, they gain access to opportunities for learning. Amy discovered an untapped confidence in being a student of science because she became involved in negotiation for understanding.

Second, there are many norms that are constructed within a classroom community and these norms are significant in how a class chooses to take up student-student negotiation. In this particular class, students were willing to take up and give roles within the cooperative learning groups they worked in. John was seen as an expert because of his previous science background and vocabulary and because of his demeanor. But John did not become an expert until the role was given to him by other members of the group and he chose to accept it.

Therefore, since classroom communities are actively involved in the building of norms of operation and engagement, it is crucial that teachers address the need for students to feel included in the learning process. More specifically, the development of inclusive norms within a class can provide students with the foundation from which they can construct understanding. The students can be given status as learners and as valued members with something to contribute to the negotiation of understanding within a group.

Third, prior knowledge is a significant factor in the negotiation of understanding. Students were willing to draw on outside experiences during their attempt to gain new understanding with the context of a new problem. Kristy demonstrated this when she was trying to answer the question involving the fish and the laser. She had prior knowledge pertaining to spear fishing but not laser fishing so she drew on her previous experience to help the group's negotiation. She continued to give disclaimers that spear fishing was not laser fishing. The group acknowledged that they were not the same but still used that prior understanding

as a platform from which to move to new understanding.

Schmidt and Patel (1987) have argued that prior knowledge that is activated can be effective even if it is not correct. They concluded that, "The cognitive conflict between naive and imprecise conceptions of the world and scientific knowledge may be a major source of learning" (p. 8). Since prior knowledge has been shown to be a significant component of student negotiation, students must be encouraged to seek ways to connect previous life experiences and understanding with the new negotiation that is taking place as they learn new material.

Conclusion

Upon reflecting on Brunerís (1996) work, The Culture of Education, it becomes apparent that the learner he describes is one that is involved in the negotiation for understanding. Bruner presented four crucial ideas related to the actions of students as they attempt to gain understanding. He stated:

> The first of these is the idea of *agency* : taking more control of your own mental activity. The second is *reflection* : not simply "learning in the raw" but making what you learn make sense, understanding it. The third is *collaboration* : sharing the resources of the mix of human beings involved in teaching and learning. Mind is inside the head, but it is also with others. And the fourth is *culture* , the way of life and thought that we construct, negotiate, institutionalize, and finally (after itís all settled) end up calling "reality" to comfort ourselves. (p. 87)

As Bruner characterized what takes place within a student as they negotiate for understanding, it becomes apparent that negotiation is vital to the gaining of understanding. In addition, student- student interaction is part of the "mix of human beings" needed for learning to occur. This study has attempted to shed light on student- student negotiation for understanding. The challenge for educators is to seek ways in which to make this negotiation as effective as possible for all students.

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